REMARKS

In view of the above amendments and following remarks, reconsideration and further examination are requested.

The specification and abstract have been reviewed and revised to make editorial changes thereto and generally improve the form thereof, and a substitute specification and abstract are provided. No new matter has been added by the substitute specification and abstract.

Claims 1-7 have been canceled and claims 8-27 have been added. New claims 8-27 have been drafted taking into account the 35 U.S.C. § 112, second paragraph, issues raised by the Examiner, are believed to be free of these issues, and are otherwise believed to be in compliance with 35 U.S.C. § 112, second paragraph.

The present invention is directed to a spent nuclear fuel reprocessing apparatus. In order to continuously conduct efficient and stable dissolution of powder of spent nuclear fuel, the apparatus is provided with, as shown in Fig. 1 for example: a dissolving tank (1); an agitating member (3) rotatably disposed in the dissolving tank; and a powder supply system (7, 5) for continuously supplying the powder of the spent nuclear fuel into a lower part of the dissolving tank. In such a dissolving apparatus, rotation of the agitating member causes a swirling and rising flow above the agitating member, upon which flow non-dissolved fine particles (spent nuclear fuel powder) ride so as to rise or ascend. As a result, these non-dissolved particles may disadvantageously be discharged from the dissolving tank.

In order to address this problem, rise inhibiting structure is provided within the dissolving tank above the agitating member such that the swirling and rising flow collides with the rise inhibiting structure to change its flow direction to downward. Thus, there is little possibility that non-dissolved particles will be discharged from the dissolving tank. Accordingly, in the powder dissolving apparatus of the present invention, spent nuclear fuel powder is continuously supplied into the dissolving tank at a lower part thereof, dissolution of the spent nuclear fuel powder is efficiently performed below the rise inhibiting structure, and a solution including well-dissolved

spent nuclear fuel powder is allowed to be discharged from the dissolving tank without any non-dissolved particles being discharged from the dissolving tank.

New claims 8 and 18 are believed to be representative of Applicants' inventive spent nuclear fuel reprocessing apparatus.

In the Office Action mailed May 3, 2006: claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by JP '038; claims 1-3 were rejected under 35 U.S.C. § 102(b) as being anticipated by DE '817; claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by JP '878; claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by JP '444; claims 2-5 were rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over JP '444; claims 1-3 and 6 were rejected under 35 U.S.C. § 102(b) as being anticipated by JP '913; and claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Ledebrink et al. in view of JP '444.

These rejections are respectfully traversed, and the relied-upon references are not applicable with regard to the currently presented claims for the following reasons.

Claim 8 recites

> An apparatus for reprocessing spent nuclear fuel, comprising:
> a dissolving tank having an inlet in a lower part thereof;
> a powder supply system, in communication with said inlet, for continuously supplying powder of spent nuclear fuel through said inlet and into a lower portion of said dissolving tank;
> an agitating member rotatably disposed in said dissolving tank; and
> rise inhibiting structure, disposed in said dissolving tank above said agitating member, for inhibiting non-dissolved powder of the spent nuclear fuel from rising while allowing a solution including dissolved powder of the spent nuclear fuel to flow upwardly past said rise inhibiting structure.

Similarly, claim 18 recites

> An apparatus for reprocessing spent nuclear fuel, comprising:
> a dissolving tank having an inlet in a lower part thereof;
> a powder supply system, in communication with said inlet, for continuously supplying powder of spent nuclear fuel through said inlet and into a lower portion of said dissolving tank;

an agitating member rotatably disposed in said dissolving tank; and

means for inhibiting non-dissolved powder of the spent nuclear fuel from rising while allowing a solution including dissolved powder of the spent nuclear fuel to flow upwardly past said means.

The apparatus as recited in either of these is not taught or suggested by the references relied upon by the Examiner either taken alone or in combination.

JP '038

JP '038 discloses an apparatus for treating a high viscosity liquid, and is not concerned with reprocessing spent nuclear fuel. In JP '038, when a solution having high viscosity in a container 1 is agitated using a blade 4 mounted on a shaft 3, this viscous solution is wound around the shaft and rises along the shaft. In order to overcome this problem, a disk 5 or 6 is mounted on the shaft for preventing winding of viscous solution 2 around the shaft and rising along the shaft. The container 1 of JP '038 is not provided with structure for continuously charging the high viscosity liquid to be agitated, and accordingly, the apparatus of JP '038 is designed to operate in a batch-wise manner. Thus, the structure recited in claims 8 and 18 allowing for continuous operation is lacking from JP '038. Namely, in JP '038 there is no structure corresponding to **an inlet in a lower part of a dissolving tank** and **a powder supply system in communication with the inlet for continuously supplying powder into the dissolving tank**. Thus, for this reason alone, neither of claims 8 and 18 is anticipated by JP '038.

Additionally, because JP '038 is not concerned with continuously reprocessing spent nuclear fuel, but rather is concerned with treating a high viscosity liquid in a batch-type manner, JP '038 belongs to a technical field that is quite different from that to which the instant invention belongs, and operates in a totally different manner than does the inventive apparatus. As such, it is respectfully submitted that the disk 5 or 6 of JP '038 cannot reasonably be corresponded to the **rise inhibiting structure** of claim 8 nor the **means for inhibiting...** of claim 18. Specifically, there is no discussion of this disk **inhibiting non-dissolved powder from rising while allowing**

a solution including dissolved powder to flow upwardly, as required by each of claims 8 and 18. For this additional reason, neither of claims 8 and 18 is anticipated by JP '038.

DE '817

DE '817 discloses an apparatus for mixing chemical liquids and is not concerned with reprocessing spent nuclear fuel. In DE '817 provided is a chemical liquid mixing tank 1 in which a charge of two or more fluids are held and agitated by a central mixer 2. By this mixing motion, a down-flow is set up at a center which is reversed at a base, and rises up along an inner wall of the tank, thereby creating a trumpet-shaped center depression in a fluid surface. The inner wall of the tank is provided with a number of radial baffle vanes 3 positioned between a surface of the liquid at rest and a crest of fluid under mixing conditions. Because of the baffle vanes, some of liquid flow is redirected downward towards a center of the tank to thereby inhibit creation of the depression in the fluid surface and maintain the fluid surface to be nearly level. The tank 1 of DE '817 is not provided with structure for continuously charging fluids to be mixed, and accordingly, the apparatus of DE '817 is designed to operate in a batch-wise manner. Thus, the structure recited in claims 8 and 18 allowing for continuous operation is lacking from DE '817. Namely, in DE '817 there is no structure corresponding to **an inlet in a lower part of a dissolving tank** and **a powder supply system in communication with the inlet for continuously supplying powder into the dissolving tank**. Thus, for this reason alone, neither of claims 8 and 18 is anticipated by DE '817.

Additionally, because DE '817 is not concerned with continuously reprocessing spent nuclear fuel, but rather is concerned with mixing chemical liquids in a batch-type manner, DE '817 belongs to a technical field that is quite different from that to which the instant invention belongs, and operates in a totally different manner than does the inventive apparatus. As such, it is respectfully submitted that the radial baffle vanes 3 of DE '817 cannot reasonably be corresponded to the **rise inhibiting structure** of claim 8 nor the **means for inhibiting...** of claim 18. Specifically, there is no discussion of the radial baffle vanes **inhibiting non-dissolved powder from rising while allowing a solution including dissolved powder to flow upwardly**,

as required by each of claims 8 and 18. For this additional reason, neither of claims 8 and 18 is anticipated by DE '817.

JP '444

JP '444 discloses a stirring apparatus that is capable of restraining bubbles from being included in a liquid, and is not concerned with reprocessing spent nuclear fuel. JP '444 uses a plate-like part material 5 disposed in a reaction container 4 above impeller 2. The container 4 of JP '444 is not provided with structure for continuously charging fluids to be mixed, and accordingly, the apparatus of JP '444 is designed to operate in a batch-wise manner. Thus, the structure recited in claims 8 and 18 allowing for continuous operation is lacking from JP '444. Namely, in JP '444 there is no structure corresponding to **an inlet in a lower part of a dissolving tank** and **a powder supply system in communication with the inlet for continuously supplying powder into the dissolving tank**. Thus, for this reason alone, neither of claims 8 and 18 is not anticipated by JP '444.

Additionally, because JP '444 is not concerned with continuously reprocessing spent nuclear fuel, but rather is concerned with restraining bubbles generated when performing operations in a batch-type manner, JP '444 belongs to a technical field that is quite different from that to which the instant invention belongs, and operates in a totally different manner than does the inventive apparatus. As such, it is respectfully submitted that the plate-like part material 5 of JP '444 cannot reasonably be corresponded to the **rise inhibiting structure** of claim 8 nor the **means for inhibiting...** of claim 18. Specifically, there is no discussion of the plate-like part material **inhibiting non-dissolved powder from rising while allowing a solution including dissolved powder to flow upwardly**, as required by each of claims 8 and 18. For this additional reason, neither of claims 8 and 18 is anticipated by JP '444.

JP '878

JP '878 discloses a slurry dispersing apparatus and is not concerned with reprocessing spent nuclear fuel. In a conventional slurry dispersing apparatus, centrifugal force is generated in

slurry 16 within a slurry tank 2 due to rotation of a stirrer 11 and an agitating blade 14. As a result, a liquid surface of the slurry becomes the shape as shown by a two-dot chain line in Fig. 1; namely, higher at an outer peripheral side and lower near a center of the slurry tank. In such a condition, the slurry in the slurry tank is accumulated at the outer peripheral side of the tank and is not introduced into a barrel 3 from a central opening part 5 thereof. Thus, the slurry is not homogeneously agitated by granular media 12 in the barrel, and efficiency of dispersion and homogeneity of the slurry is lowered. In order to overcome this drawback, the liquid surface of the slurry in the slurry tank is covered with a slurry presser 17. By leveling the liquid surface of the slurry by using the slurry presser, smooth circulation of the slurry through the barrel is accomplished and homogeneously dispersed slurry can be obtained.

Because JP '878 is not concerned with continuously reprocessing spent nuclear fuel, but rather is concerned with treating a slurry, JP '878 belongs to a technical field that is quite different from that to which the instant invention belongs, and operates in a totally different manner than does the inventive apparatus. As such, it is respectfully submitted that the slurry presser 17 of JP '878 cannot reasonably be corresponded to the **rise inhibiting structure** of claim 8 nor the **means for inhibiting...** of claim 18. Specifically, there is no discussion of the slurry presser **inhibiting non-dissolved powder from rising while allowing a solution including dissolved powder to flow upwardly**, as required by each of claims 8 and 18. Thus, neither of claims 8 and 18 is anticipated by JP '878.

JP '913

JP '913 discloses a solid-liquid separator and is not concerned with reprocessing spent nuclear fuel. In JP '913, a solid and liquid are separated from each. Water to be treated, such as a liquid waste, is introduced into a separation tank 2 via an inlet 6. The separation tank is divided by a porous member 3 into an upper separation region 2a and a lower flow region 2b. The liquid waste in the lower flow region is agitated by a stirring blade 4. A guide plate 5 is erected at a central part of a lower surface of the porous member and converts whirling flow A, generated by the stirring blade, to downward flow B. Because precipitable material in the water

to be treated (such as, for example, flocculate of activated sludge in the liquid waste) within the lower flow region is flown by force of inertia of a horizontal direction due to the whirling flow A generated by rotation of the stirring blade, the precipitable material hardly accompanies ascending flow C depending on liquid waste feed quantity or the like, and receives a downward force due to the downward flow B to thereby precipitate the precipitable material in the lower portion of the separation tank. This precipitate is discharged via outlet 8. Separated liquid which flows upward through holes in the porous member 3 is discharged via outlet 9. A water stop member 11 is provided at a central part of the porous member 3 where the guide plate is disposed. The water stop member has no through hole and functions to inhibit generation of an ascending flow.

Because JP '913 is not concerned with continuously reprocessing spent nuclear fuel, but rather is concerned with separating solids from a liquid, JP '913 belongs to a technical field that is quite different from that to which the instant invention belongs, and operates in a totally different manner than does the inventive apparatus. As such, it is respectfully submitted that none of the porous member 3, the guide plate 5, and the water stop member 11, of JP '913 can reasonably be corresponded to the **rise inhibiting structure** of claim 8 nor the **means for inhibiting...** of claim 18. Specifically, there is no discussion of the porous member, guide plate or water stop member **inhibiting non-dissolved powder from rising while allowing a solution including dissolved powder to flow upwardly**, as required by each of claims 8 and 18. Thus, neither of claims 8 and 18 is anticipated by JP '913.

Ledebrink et al.

Ledebrink et al. discloses an apparatus comprising a suspension tank 3 into which PuO_2 powder and nitric acid are fed and mixed by a stirrer 3a, and a dissolving tank 4 into which a suspension (a mixture of PuO_2 and nitric acid) is drained from the suspension tank to dissolve PuO_2 powder in nitric acid. With the present invention, the suspension tank and the dissolving tank of Ledebrink et al. are unified into a single dissolving tank 1. Thus, the apparatus of Ledebrink et al. is different from the apparatus of the present invention.

Additionally, the suspension tank 3 and dissolving tank 4 are each operated in a batch-type manner. Namely, after supplying the suspension from the suspension tank 3 into the dissolving tank at the top thereof, the dissolving tank is sealed gas-tight and heated to 220°C at a pressure of 64 bar for 20 hours. At the end of this dissolving time, pressure in the dissolving tank is released and a plutonyl-nitrate solution contained in the dissolving tank is discharged via pipeline 8a at a bottom of the dissolving tank. Because of this batch-type operation, Ledebrink et al. is not provided with structure for continuously charging material to be dissolved. Thus, the structure recited in claims 8 and 18 allowing for continuous operation is lacking from Ledebrink et al. Namely, in Ledebrink et al. there is no structure corresponding to **an inlet in a lower part of a dissolving tank** and **a powder supply system in communication with the inlet for continuously supplying powder into the dissolving tank**. Thus, neither of claims 8 and 18 is anticipated by Ledebrink et al.

The Examiner has indicated that positioning the supply system at a lower part of the dissolving tank of Ledebrink et al. would have been obvious to one having ordinary skill in the art. However, in the batch-type apparatus of Ledebrink et al., there is no reason to provide a supply system at the lower part of the dissolving tank, unlike with the instant inventive apparatus wherein providing the supply system at the lower part is necessary due to the continuous manner of operation thereof.

The Examiner also recognizes that rise inhibiting means is lacking from Ledebrink et al., and thus relies upon JP '444 for concluding that it would have been obvious to provide such means in Ledebrink et al. However, it would be meaningless to provide the plate-like material part 5 of JP '444 in the dissolving tank 4 of Ledebrink et al., because there is no concern of bubbles being generated in this tank. And, if the plate-like material part were provided in suspension tank 3, because the PuO_2 powder is not dissolved therein, the plate-like material part could not function to **inhibit non-dissolved powder from rising while allowing a solution including dissolved powder to flow upwardly**, as required by each of claims 8 and 18. Accordingly, neither of claims 8 and 18 is obvious over a combination of Ledebrink et al. and JP

'444. For analogous reasons, a combination of Ledebrink et al. with any of the other references would not render either of claims 8 and 18 obvious.

In view of the above, claims 8-27 are allowable over the relied-upon references either taken alone or in combination.

Additionally, each of claims 10, 17, 20 and 27 is patentable in its own right, since the subject matter recited in these claims is not taught or suggested by any of the relied-upon references.

In view of the above amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and an early Notice of Allowance is earnestly solicited.

If after reviewing this Amendment, the Examiner believes that any issues remain which must be resolved before the application can be passed to issue, the Examiner is invited to contact the Applicants' undersigned representative by telephone to resolve such issues.

Respectfully submitted,

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